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space to have described the features in terms to permit generalizations to be made. Certainly if any description at all is given it should be in the form that even a geologist would find useful. Nevertheless it must be said that no similar work has been published and that the material is put in such convenient form that a valuable service has been rendered by the authors in publishing their book.

#### EUROPEAN TORNADES

ALFRED WEGENER. **Wind- und Wasserhosen in Europa.** xi and 301 pp.; maps, diagrs., ill., bibliogr. (Series: Die Wissenschaft: Sammlung von Einzeldarstellungen aus den Gebieten der Naturwissenschaft und der Technik, Vol. 60.) Friedr. Vieweg & Son, Brunswick, 1917. M. 12. 9 x 6 inches.

Because of the extraordinary intensity and great frequency of tornadoes in the United States, American meteorologists have rather naturally paid very little attention to these phenomena in other countries, as they there occur in milder form and relatively rarely. Thus in one of the standard American textbooks on meteorology we find only the following statement regarding tornadoes outside of the United States: "They are known in less frequent occurrence in Europe and other parts of the world," and in another recent textbook we read "the tornado . . . is peculiar to the United States, although in a slightly modified form it at times occurs in other parts of the world." Even in Hann's monumental and extraordinarily comprehensive "Lehrbuch der Meteorologie" (3d edition), of the 12½ pages devoted to whirlwinds, tornadoes, and waterspouts, 8½ concern the tornadoes of the United States and the remaining 4 deal with these phenomena in other countries. It is, indeed, almost certain that very few of our professional meteorologists have any clear ideas concerning what we call "tornadoes" in other parts of the world.

For this reason we welcome Dr. Wegener's new and very careful study of the whirlwinds (*Windhosen, Tromben*) and waterspouts of Europe. The author has collected, from a wide range of literature, the available observations and descriptions of these phenomena; he has classified and summarized these accounts from the standpoint of their physical explanation; and he has given a clear and withal an interesting discussion of the various characteristics of whirlwinds and of waterspouts. It is nearly fifty years (Reye, 1872) since any attempt has been made to collect and summarize the facts concerning European whirlwinds. Dr. Wegener has expressly limited his study to Europe, as he says in his preface and as his title indicates, but there are frequent comparisons with the phenomena of American tornadoes. The author confesses that he has not been able to collect all the existing accounts of European whirlwinds, partly because of the exigencies of the war. The preface is dated "In the Field," August, 1916.

The portions of this monograph which naturally attract the attention of an American reviewer are those which emphasize the striking differences existing between the mild, infrequent, and relatively safe whirls of Europe and the violent, frequent, and destructive American tornadoes. Thus (p. 85) four years, 1883-1886, brought, according to Finley, 777 tornadoes in the United States, while the four years with the most tornadoes in Europe, viz. 1884-1887, gave only 35. European thunderstorms bring most tornadoes in autumn and early winter and in the morning hours, while in the United States the maximum number of tornadoes comes in spring and early summer, and in the afternoon. Of 89 weather maps on days with tornadoes in Europe, only 49 showed marked barometric depressions. In relation to the particular octant of the depression in which these disturbances are most frequent, Dr. Wegener's figures show this to be east-southeast. The prevailing direction of progression is from southwest and west, as here. The average velocity is about 14½ miles an hour, which is only about one-third of that in the United States. More than one-half of the paths which can be clearly determined for Europe give an average length of between 0.6 mile and 6 miles (1-10 kilometers). The duration of 61 per cent of the tornadoes which have been studied was between 5 and 30 minutes. But the most striking fact about European tornadoes is their very slight destructiveness. Thus loss of life is reported in only 5 per cent of the cases cited; and a liberal allowance for loss of life, which it is impossible to determine with accuracy, gives an average of 0.4 for the number of deaths per tornado. It is surely unnecessary to give any comparative statistics for the United States. Of 25 cases in which the direction of rotation was noted, 18 showed cyclonic and 7 showed anti-cyclonic rotation.

Dr. Wegener has brought together (pp. 275-279) several personal accounts of the direct contact of ships at sea with waterspouts. This particular relation of waterspouts has been much discussed, and there are many exaggerated views in regard to it. A reading of these narratives leads to the irresistible conclusion that waterspouts relatively rarely do serious damage to vessels which come in contact with them.

There are numerous illustrations of waterspouts, some from photographs and some from sketches, including among the former three pictures of the Marthas Vineyard waterspout of August 19, 1896, but there is no half-tone of a tornado funnel cloud. The remaining illustrations include maps, diagrams, and views of Weyher's experiments in the artificial production of whirlwinds. A brief discussion of the various theories regarding the origin of tornadoes and of the other less violent whirlwinds of Europe leads our author to acceptance of the mechanical theory. In this, "the temperature conditions are not considered the primary cause and the rotation the effect, but the rotation, whether produced mechanically or hydrodynamically, is believed to be the cause of the thermodynamic effects, the latter manifesting themselves in the condensation of the funnel cloud."

Dr. Wegener's monograph very satisfactorily fills in a missing chapter of modern meteorological science. It merits careful study.

R. DEC. WARD

#### JAPANESE RAINFALL

TORAHIKO TERADA, TOKEZO YOKOTA, AND SYOHU OTUKI. **On the Distribution of Cyclonic Precipitation in Japan.** 32 pp.; diagrs. *Journ. College of Sci., Tokyo Imp. Univ.*, Vol. 37, Art. 4, 1916. [Author's abstract in *Monthly Weather Rev.*, Vol. 44, 1916, pp. 127-128.]

All well-defined cyclones occurring in the Japanese region, 1905-1915, were used in making two sets of charts: (1) showing lines of equal percentage of precipitation expectation for different locations of cyclones; and (2) for six divisions of each of the three groups—Pacific, Middle, and Japan Sea—showing by lines the percentage rainfall expectation when cyclones are in different positions.

Temperature differences due to latitude here as elsewhere cause precipitation most frequently on the eastern side of the cyclone. The exposure of the Pacific coast to warm east and south winds gives it greater cyclonic rainfall frequency than the cooler Japan Sea coast.

The land side of a cyclone usually has less rainfall than the water side. On the Pacific coast of Japan the northeast quadrant is rainiest, while on the other coast the expectation of rain is about the same in all parts of a cyclone. On the western coast of Yezo, however, as in parts of western Europe, the greatest frequency comes in the southwest quadrant of a cyclone.

In mountainous Japan, Professor Terada emphasizes the topographic effect on precipitation. For instance, when a cyclone is some distance northwest, the expectation of precipitation is greatest on the coasts. On the Pacific side it rains because of the ocean air rising over the shore and mountains, on the Japan Sea coast because of cyclonic action. Topographical influence on the mere occurrence of rain is most apparent when a cyclone is far away: when it is in the southwest, the rain area extends far north on the Pacific coast of Japan; but when in the northeast, the rain area is most extensive southward on the Japan Sea coast.

These results seem strikingly like a description of the cyclonic distribution of precipitation in the eastern United States, where the Appalachians correspond to the Japanese mountains, and the Great Lakes and Mississippi Valley have effects similar to the Japan Sea (cf. in *Monthly Weather Rev.*: W. G. Reed, Vol. 39, 1911, pp. 1609-1615; C. F. Brooks, Vol. 42, 1914, pp. 318-330; H. H. Clayton, Vol. 44, 1916, p. 81, last paragraph and map).

CHARLES F. BROOKS

#### TRAVEL ON THE KANSU-TIBET BORDER

REGINALD FARRER. **On the Eaves of the World.** Vol. 1, xii and 311 pp.; map, ills.; Vol. 2, viii and 328 pp.; map, ills., index. Edward Arnold, London, 1917. 9 x 6 inches.

Mr. Farrer is a student of plant life. He visited the boundary region of Kansu-Tibet from south to north to look for flora that might stand the British climate better than products of the warmer parts of China. He was especially interested in looking for new flowers.

"On our grey mood the dawn came grey and weeping" is a fair specimen of the light, literary touch that permeates the whole work and is responsible for the thickness and weight of the two volumes. There is little geography and no geology in the book, but the author gives hundreds of pages to his travels along the roads, the people he met, and his pleasant and disagreeable experiences. Impressions so lightly gained are scarcely more than skin deep and have little worth in evaluating the essence of a country or people. Some three pages given to the vagaries of Mr. Farrer's cook seem to justify